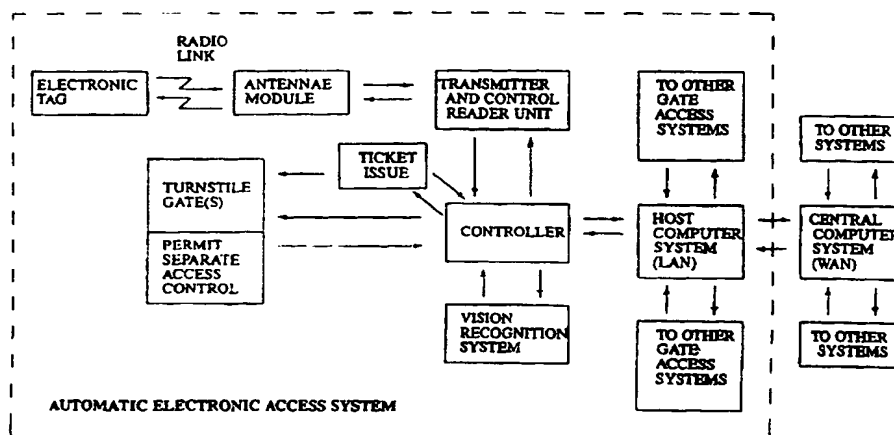




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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**(54) Title:** ELECTRONICALLY CONTROLLED ACCESS/MONITORING SYSTEM**(57) Abstract**

An electrically controlled access/monitoring system which is operative to control access to a controlled area by persons having individual user tags bearing unique remotely readable data, in which the system comprises: an entry control station; a monitoring arrangement at the entry control station to monitor individual user tags of persons requiring entry to the controlled area, the monitoring arrangement being capable of reading the data by transmission of electro-magnetic signals e.g. radio signals between an active or passive tag and the monitoring arrangement; and a control system which is responsive to monitoring signals generated by the monitoring arrangement in order to permit or to deny entry to the controlled area, with the control system preferably including a ticket issuing machine to issue an entry ticket to each monitor permitted tag user, and a gate which is operable to allow access to the controlled area on presentation of an issued ticket.

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## ELECTRONICALLY CONTROLLED ACCESS/MONITORING SYSTEM

This invention relates to an electronically controlled access/monitoring system which relies upon use of pre-authorised user tags to allow entry to a controlled area.

The invention has been developed primarily in connection with a crowd control system to control spectator entry to restricted areas, including sports stadiums, sporting events, festivals, conferences and places of entertainment etc, in which it is important to permit authorised access only, and to indicate/prevent unauthorised access. In the case of paid, and pre-paid attendance to such events, eg, football matches, it is important to provide a system which can readily recognise attempts at unauthorised entry, eg, a known trouble maker who is barred from entry, whilst at the same time provide rapid processing of all authorised attendees. Also the control and monitoring system enables authorised tags to be used at different venues, eg. personal tags issued to home supporters may be authorised to permit attendance at away matches etc. The need for season tickets would be eliminated.

Overall control of crowd numbers is also important, and desirably the system also can provide suitable indication to authorised attendees of designated spectator areas, eg, seat, row and number.

According to the invention there is provided an electrically controlled access/monitoring system which is operative to control access to a controlled area by persons having individual user tags bearing unique remotely readable data, said system comprising:

- an entry control station;

- a monitoring arrangement at the entry control station to monitor individual user tags of persons requiring entry to the controlled area, said monitoring arrangement being capable of reading the data by transmission of electromagnetic signals between each tag and the monitoring arrangement; and

- a control system responsive to monitoring signals generated by the monitoring arrangement in order to permit or to deny entry to the controlled area.

The invention may be applied with particular advantage to

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a crowd control system to control and monitor spectator entry to sporting fixtures, such as football, rugby, cricket or athletic events etc, but also it should be understood that the control system of the invention may be used in other environments in which it is important to recognise and admit to a controlled area (conferences, offices etc) holders of authorised tags, and to indicate/prevent access to the users of unauthorised tags.

As indicated above, the electronically controlled access monitoring system according to the invention requires the use of electronic tags, which may be of the "passive" or "active" type (as will be well known to those of ordinary skill in the art), and which can be monitored by a suitable interrogator/antenna, and which (a) reads the stored information, (b) compares it with stored data in the system and (c) allows or refuses access to a controlled area accordingly.

This invention, therefore, relates to apparatus enabling organisations to automatically permit access to stadia, sports arenas, clubs and other premises including buildings, compounds or subsets thereof, as well as moving objects (transport related) by allowing entrance/access to authorised personnel only (spectators, members, customers, clients, employees, etc). The system operates electronically.

All aspects of crowd control, at all types of events, involving the use of tickets or passes or other means of controlling and permitting access, whether charged for or not, generally burdens the organising authority with the requirement to ensure that all possible protection measures have been taken to cater for the safety and security of all concerned. Such measures are often undertaken in conjunction with the police.

With a view to reducing incidents in the vicinity of major sporting events, and the like, legislation has recently been introduced in the UK to make ticket touting an offence. The present invention would not only virtually eliminate the chance of touting but would also prevent forgery and stop gate-crashing. It would not be possible to gain access to an enclosed area/event (stadium, club, exhibition/conference

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centre etc) without approved authorisation, ie bona fide ticket holder, season ticket holder, club membership etc. Also, it would not be possible to exceed the seating capacity or the permitted maximum attendance at an event as allowed by safety regulations without the organisers/management being aware of the circumstances. It makes no difference whether an event is all seating, all standing or a mixture of both.

The method of payment, whether for all ticket events or not, and whether at home or away or even abroad, or even when authorising travel on ferries, aircraft, trains, coaches etc, is immaterial and would be no different from conventional methods. The opportunity presents itself for simple cash free transactions to be introduced/adopted.

In the case of a sports club/football ground etc, the entry would be likely to be via a turnstile or similar type of controlled access point(s). In the case of horse racing etc, entry could even be by "open" gate whereby tag holders would be channelled through a field of influence. Non-authorized participants would trigger an alarm. Should a tag be lost or stolen, access to any unauthorised person/would be/could be denied once the loss had been reported. In a more sophisticated format the tag would be manufactured with a read/write capability and contain an electronic alpha numeric display which would be capable of indicating the allocated seat number, floor level, particular enclosure, special message etc. Anybody occupying an unauthorised seat or entering the wrong enclosure could be readily identified. Away supporters or visitors etc to an event could be allocated seating in accordance with policies or requirements (segregation of rival fans etc).

Tags could also contain cash units (currency-prepaid etc) which could be capable of being decremented. Tags could be authorised for use by a third party, with permission, otherwise access would be refused. Offenders could be apprehended/penalised. A single tag could also be authorised to permit more than one person passing through a turnstile (if programmed).

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The system consists of a tag, of any shape, possibly produced in the form of an emblem/logo or souvenir, representing the motif of the club/organisation or event to which it is applicable. It might be produced in any material including paper, card and plastic etc. In its simplest form the tag would be passive, containing a unique identification number (encrypted, if appropriate, for interrogation purposes) which when worn/carried by its owner/user would automatically permit access to authorised premises.

Whether active or passive, tags would be cheap to produce and could be used as a one-off (paper ticket etc). They could be disposed of after the event or kept as souvenirs. (If produced in the form of a small football, Olympic badge etc).

The back office system, the system's integration, networking, the development of databases and the customised software would cater for all data processing. Intelligence within the tags as with the networking would suit the purpose for which it was being adopted. For example intelligence within sports club tags could (say) be linked to a lapsed time clock (quartz/digital within the IC). Any player/participant, authorised to enter an area (court, pool, pitch, course, billiard table etc) might be allocated a specific time or play/participation after which a warning bleep etc could/would identify the time-up period. Should play or occupancy continue, an additional charge might be levied. The lapsed time would be recorded.

Access to office premises (buildings etc) can be managed in a similar manner. Currently for security purposes, organisations such as banks, building societies, police stations, law courts, research centres or any building requiring security, generally adopts the use of pin numbers, swipe or IC (smart) card etc. This invention does not necessarily require the ID to be physically produced. Also, for high security purposes, it could be operated in conjunction with an overhead video camera/recorder (concealed above the entrance) programmed to undertake a head count of the number of people passing through the entrance, such that an alarm might

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be raised should an unauthorised person (non tag holder) accompanying a tag holder, attempt to gain access to the premises. (Certain tag holders could be programmed/authorised to permit visitor entry).

Secondary cameras for ID purposes to match individuals to tags would identify an unauthorised person entering the premises. It could also highlight misuse of tags. At any one time the number and identity of personnel on the premises might be established. Also exits and entrances would identify personnel entering and leaving. Each member of staff would be logged in and out and each visitor counted in and counted out. Micro tags might also be concealed in equipment (lap top computers etc) which, if removed from the building, (premises) other than by authorised personnel, an alarm would be raised. The system could also apply to works of art, antiques etc. If required a tag could contain personal data, and could be capable of being interrogated in an emergency for identity or medical purposes etc. If specified, both passive and non-passive tags can be made to switch on or off to suit the owner.

A system according to the invention may be inter-operable with other systems geographically spread, whereby approved user tags from any system can be used to control entry into a controlled area of another system, thereby permitting access only to authorised tag users.

A system according to the invention may be supplied as new equipment for installation on site, or may comprise suitable modification or adaptation of existing equipment in situ.

The entry control station may comprise a bank of individual processing locations, with each location having its own monitoring arrangement which monitors the user tag borne by each individual potential entrant.

The monitoring arrangement may take any suitable form, to monitor the information present on the user tag, and to be received may take the form of an interrogator antenna built into the location in any suitable way, as part of the reader system. By way of example only, an entrance hood may overlie

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the entrance location, and the antenna may be incorporated into this hood. An individual bearing his own unique user tag can then pass through the location and below the hood, and the reader can activate the tag and then interrogate the information thereon, which it then transmits by way of a suitable monitoring signal to the control system. The control system then compares this with stored data, and then permits, or denies entry to the controlled area to the individual.

The ticket issuing machine, if provided at the entry of the control station, can be operated to issue an entry ticket (desirably the ticket might have printed on it the seat number, row, block or standing area etc) to each permitted tag user, and then a gate is operated to allow access to the controlled area after issue of the entry ticket.

The gate may be triggered into operation by any suitable means, which may, for example, be upon retrieval of the entry ticket from the machine and/or through the recognition of a suitably received signal from a tag.

The mechanical gate may take any suitable form, and can take the form of a "turnstile", which is only unlocked to permit entry after issue of the entry ticket, as acceptance of the tag signal.

In the case of a passive user tag, the reader unit will be arranged to power-up the tag, which then responds with a unique identification number. If the identification number is not valid, a message can be displayed such as "not valid tag" or "go to gate X" etc.

If the identification number is valid, a ticket can be automatically issued with a designated seat number. A video camera unit provided at the second gate can be used to monitor each person making authorised entry to the spectator/play area.

The issued ticket, via RF recognition, or when inserted into a slot on the allocated seat, could be arranged to automatically unlock the seat, enabling it to be lowered into a sitting position. The method of transfer of data to unlock the seat could be by any recognised method eg, RF, magstripe, IC or other appropriate means of communication between either



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the tag, or the ticket and seat.

Within the controlled area itself, a reader unit will also check that the correct row of seats is being used. The system may be adapted to "match" an allocated seat to a particular "tag", and to give warning of any incorrect seat usage.

In the case of football match crowd control, it will usually be desirable for "home" supporters to be directed to a required entry gate(s) by printing/indicating this number on the tag. "Away" supporters can be directed to entry gates at the "away" supporters entrances.

#### Operation of reader and tag

The reader unit may transmit a continuous wave signal which is switched on and off. When the continuous wave signal is "on", this will charge-up a capacitor within the user tag. When the tag is powered, it will automatically transmit a unique pre-programmed number to the reader unit/antenna.

The reader unit is connected to a local area network to verify the number and, if appropriate, allocate the seat number.

Preferred embodiments of electronic controlled access/monitoring system according to the invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is block diagram of a first embodiment of access control system according to the invention, which is radio based.

Figure 2 is a block diagram illustrating a multiple access gate system according to the invention.

Figure 3 is a diagrammatic illustration of a tag and reader operation for use in a system according to the invention.

Figure 4 is an isometric diagram of what might be a multiple access gate system according to the invention, for controlling entry to a controlled area.

Figure 5 is an elevation of the multiple access gate system shown in Figure 4.

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Referring first to Figure 1 of the drawings, this shows a block diagram of a radio based access control system according to a first embodiment of the invention. This is an electronically controlled access/monitoring system which relies upon use of pre-authorized user tags to allow entry to a controlled area. The system comprises an entry control station and which comprises a monitoring arrangement to monitor individual user tags of persons requiring entry to the controlled area, and a control system which is responsive to monitoring signals generated by the monitoring arrangement in order to permit or to deny entry to the controlled area. If appropriate, there is also a ticket issuing machine at the entry control station to issue an entry ticket to each permitted tag user. Finally, a mechanical gate (if required) is operable to allow access to the controlled area after issue of the entry ticket (if applicable).

Figure 1 is, as mentioned above, a block diagram of a radio based access control system, and the "entry control station" will include an antennae module, a transmitter and control reader unit, a ticket issue module (if appropriate) and a turnstile gate or gates. The other components of the system, as shown diagrammatically, comprise a transmitter and control reader unit, a controller, a vision recognition system, a host computer system (LAN) a central networking computer system (WAN) linking other stadia/venues etc, and the other system components as illustrated.

The reader unit is connected to a local area network (LAN) to verify the number and also allocate the seat number (if required).

Figure 2 is a block diagram of the components which may be arranged in the immediate vicinity of a turnstile comprising an electrically controlled gate which is operable to allow access to the controlled area after issue of the entry ticket (if applicable) and following monitoring of an authorised individual user tag.

Figure 3 is a diagrammatic illustration of a passive tag and reader operation.

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Figures 4 and 5 illustrates a multiple access gate system, which comprise a bank of individual entry locations, which might be suitable for large volume spectator entry to entertainment activities eg, to one of the major premier division football clubs, etc. For specific classes of members the tag can be programmed to operate on behalf of an authorised driver, and to gain access to a control car park, the tag automatically activates the control mechanism which may take the form of rising arms, falling bollards and barriers etc.

For football clubs in general (or other sporting activities etc) a wide area network (WAN) could cover the country/continent etc, within which a central data bank might contain information of each club operating within the system(s). Authorised tags could be used equally well for away matches as for home games. Similar system could apply to personnel working for international or large organisations such as banks government departments, police forces etc.

In the application of the system to control entry to places of entertainment, such as museums, theme parks etc, a means may be provided whereby users, and in particular children, can be addressed by their personal name, either by synthesised or human voice. Thus, following entry to a theme park, or multi-entertainment complex, an entry tag, upon purchase, could take the form of a mascot fastened (say) to a chain around the neck of a child, and which would be capable of being read by a large cartoon type character etc patrolling the grounds, through an antenna in, say, the finger of the costume which would convey the child's name to the cartoon character via RF, enabling such a person to welcome or address the child by its personal name. The tag could also be read when adjacent to rides to welcome and to say farewell on departure etc.

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## CLAIMS

1. An electrically controlled access/monitoring system which is operative to control access to a controlled area by persons having individual user tags bearing unique remotely readable data, said system comprising:

an entry control station;

a monitoring arrangement at the entry control station to monitor individual user tags of persons requiring entry to the controlled area, said monitoring arrangement being capable of reading the data by transmission of electromagnetic signals between each tag and the monitoring arrangement; and

a control system responsive to monitoring signals generated by the monitoring arrangement in order to permit or to deny entry to the controlled area.

2. A system according to Claim 1, including a ticket issuing machine at the entry control station to issue an entry ticket to each monitored permitted tag user.

3. A system according to Claim 2, including a gate which is operable to allow access to the controlled area on presentation of an issued ticket.

4. A system according to any one of the preceding Claims, in which the control station comprises a bank of individual processing locations, with each location having its own monitoring arrangement which monitors the user tag borne by each individual potential entrant.

5. A system according to any one of the preceding Claims, in which the, or each monitoring arrangement includes an antenna provided at the entry control station.

6. A system according to Claim 5 when appendant to Claim 4, in which a respective antenna is built into each individual location at the entry control station.

7. A system according to Claim 6, in which each location has an entrance hood, with the respective antenna incorporated therein.

8. A system according to Claim 3, or any one of Claims 4 to 7 when appendant to Claim 3, in which the gate is arranged

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to be capable of being triggered into operation automatically, upon retrieval of an entry ticket by the ticket issuing machine and/or on acceptable reading of a tag.

9. A system according to Claim 8, in which the gate takes the form of a rotatable turnstile type gate.

10. A system according to any one of the preceding Claims, and adapted for use in a crowd control system for controlling spectator entry to an entertainment activity, in which the control system include a data store which is pre-loaded with relevant data concerning authorised user tags eg, name, address and spectator seat location.

11. A system according to Claim 3, or any one of Claims 4 to 10 when appendant to Claim 3, in which the or each gate comprises an electro-mechanically controlled device.

12. A system according to Claim 3, in which the ticket issuing machine is adjacent to the gate and which is operable automatically when a reader unit of the monitoring arrangement monitors an authorised tag user and allows access.

13. A system according to Claim 12, in which a video recorder unit is located adjacent to the gate and which is operable to record all tag users as they pass through the gate.

14. A system according to any one of Claims 1 to 13, in which the user tag is a passive user tag, and in which the monitoring arrangement is capable of powering-up the user tag, and then the tag is capable of responding with a unique identification number which, if valid, causes a reader unit to operate the gate and if not valid, to prevent operation of the gate.

15. A system according to any one of the preceding claims, including an overhead surveillance system operative to undertake a head count of people passing to the controlled area, and to compare this with the authorised number of people.

16. A system according to any one of the preceding claims, in which each user tag is capable of being worn about the person of the user, and which is capable of being read so that a pre-stored name of the user eg, a child's name can be identified and then used as a greeting to the user.

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17. A system according to any one of the preceding claims, in which an additional controlled area is provided, to be controlled by the systems, and which comprises a controlled car park, having a tag reader device operable, for an approved tag user, and on instruction from the driver or otherwise, to open a control device controlling entry to the car park eg, bollards, gates or other means.

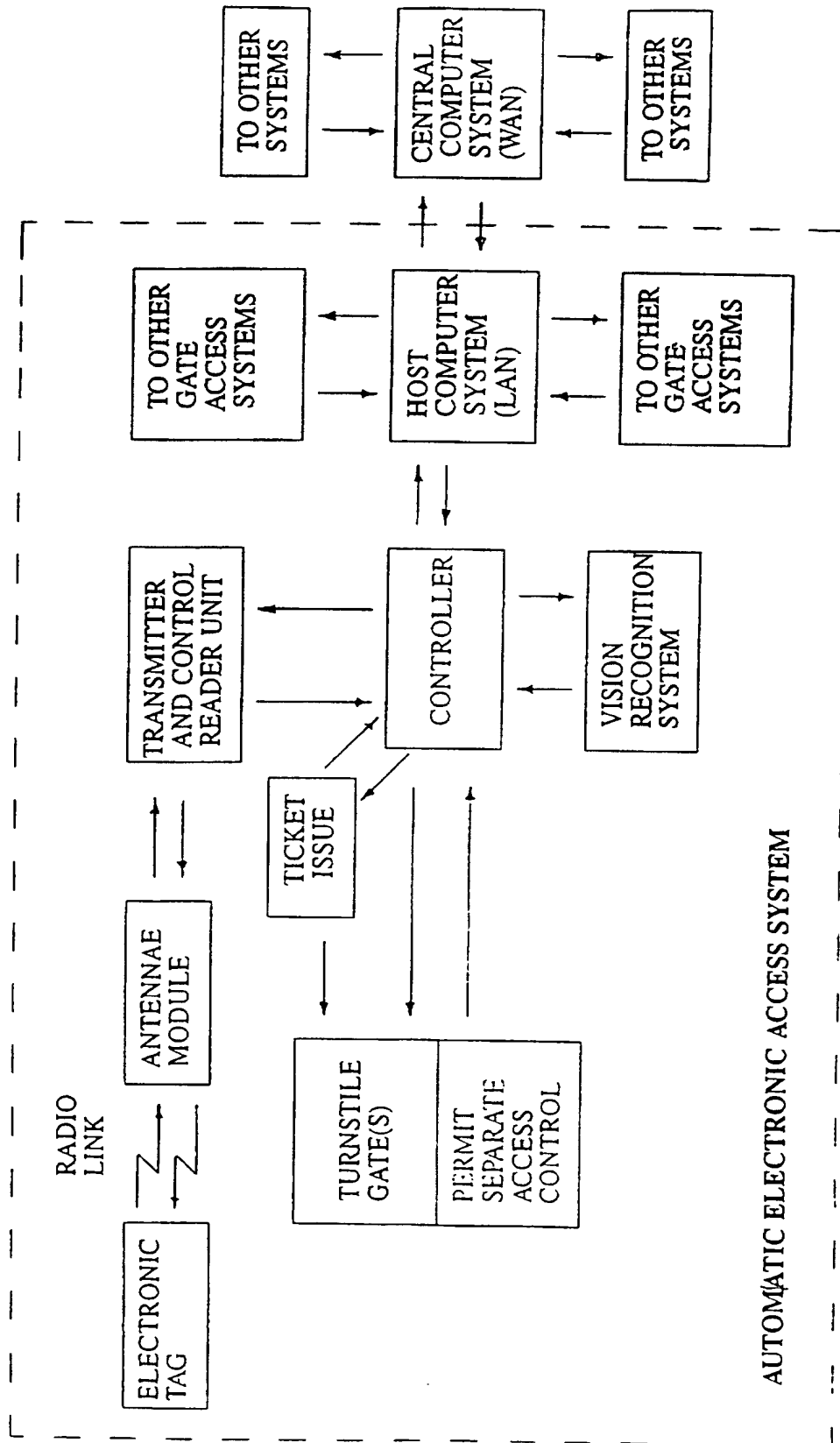
18. A system according to anyone of the preceding claims, in which each user tag is an active tag, and having a display unit operative to display indicated seat number message or parking information to the user.

19. An overall system linking any number of systems according to any one the preceding Claims, in which tags from one system can be authorised/pre-authorised for use in any other venue linked to the system, nationally or internationally.

20. A system according to anyone of the preceding claims which is an open gate system, whereby a warning signal is given in the event of an unauthorised entry.

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Figure 1 : BLOCK DIAGRAM OF RADIO BASED ACCESS CONTROL SYSTEM



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Figure 2 : MULTIPLE ACCESS GATE SYSTEM

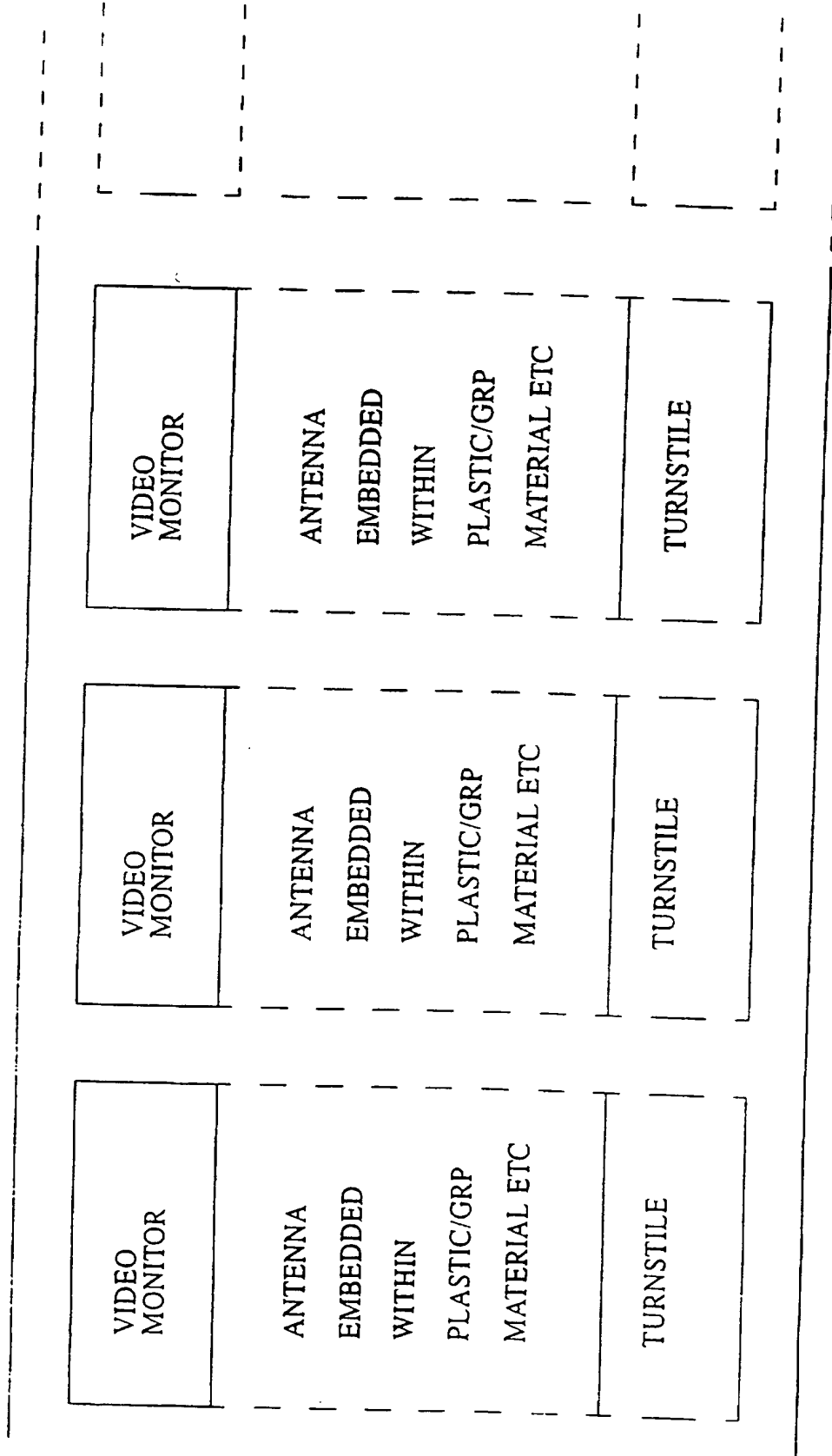
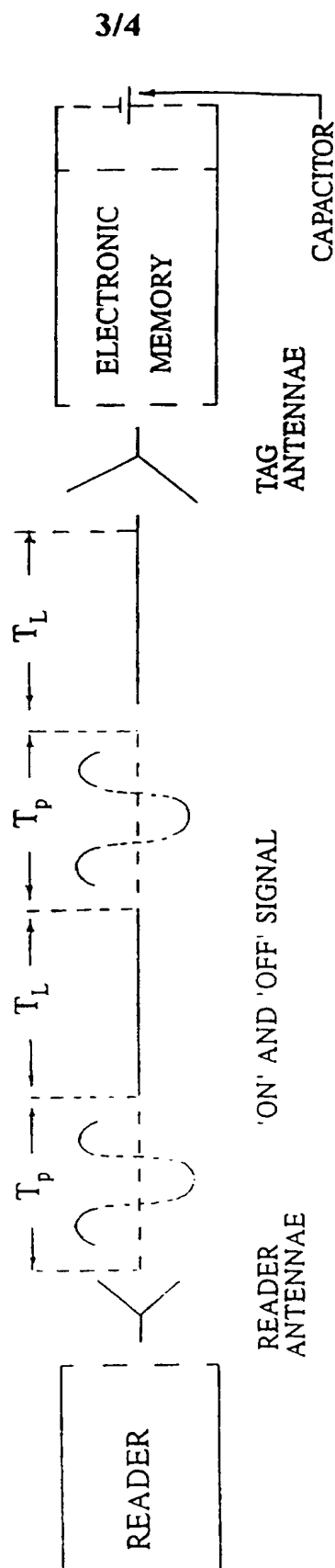




Figure 3 : TAG AND READER OPERATION (passive tag)



$T_p$  is the time required to charge up the capacitor and power up the electronic memory

$T_L$  is the time when the tag transmits its unique number to the reader

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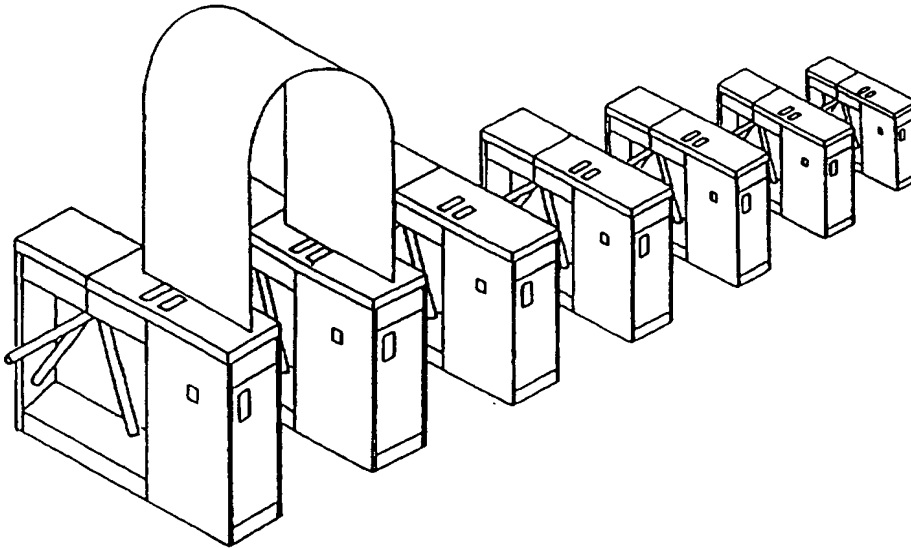


Figure 4 : Isometric diagram showing possible multiple access gate system (antenna hood shown diagrammatically covering one entrance only).

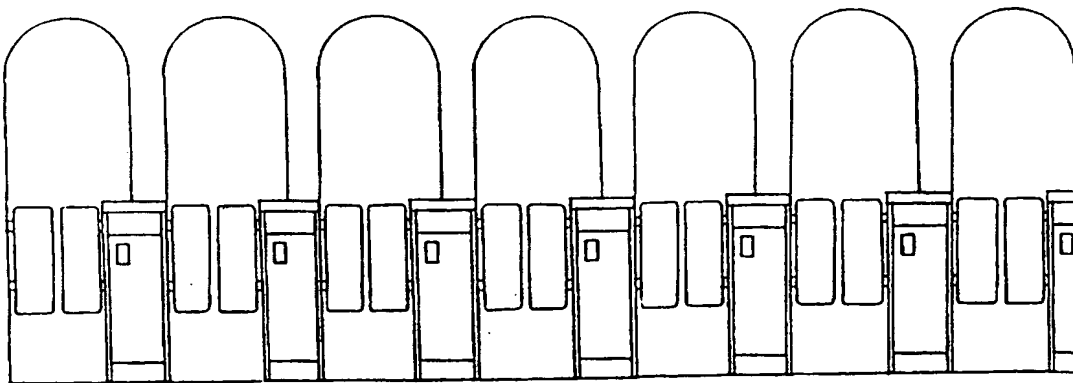


Figure 5 : Elevation of multiple access system. The number of gates accords to the capacity of the section of the complex being controlled.

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## INTERNATIONAL SEARCH REPORT

Int. Application No.

PCT/GB 97/01074

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 6 G07C9/02 G07C9/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 4 822 990 A (MASUO TAMADA, TSUTOMU TANAKA, HIDEO MATSUOKA) 18 April 1989 see column 2, line 17 - column 4, line 30; figures 1-6	1,4-8, 14,17 10,16
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☒ Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search

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European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
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Herbelet, J.C.

## INTERNATIONAL SEARCH REPORT

International Application No.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

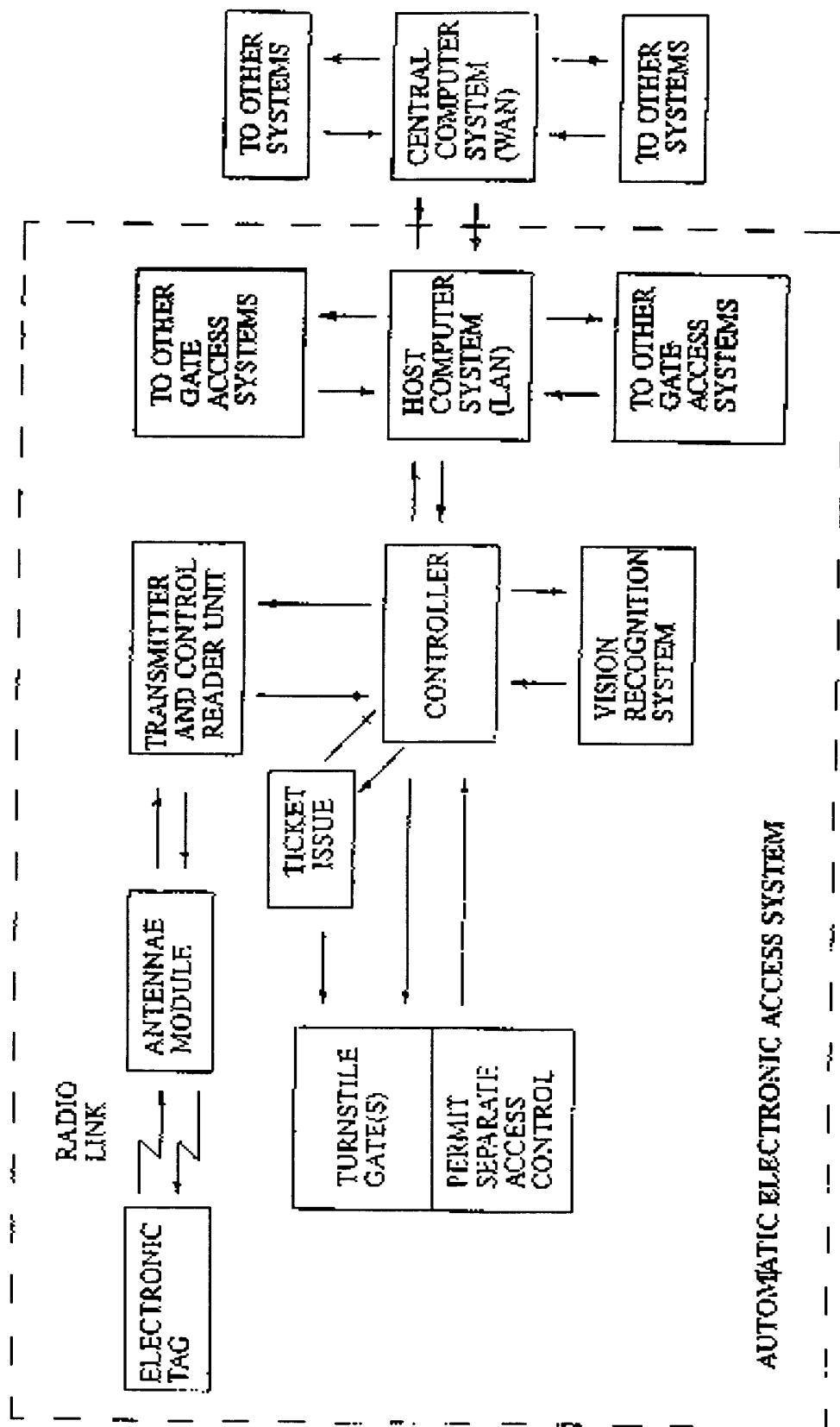
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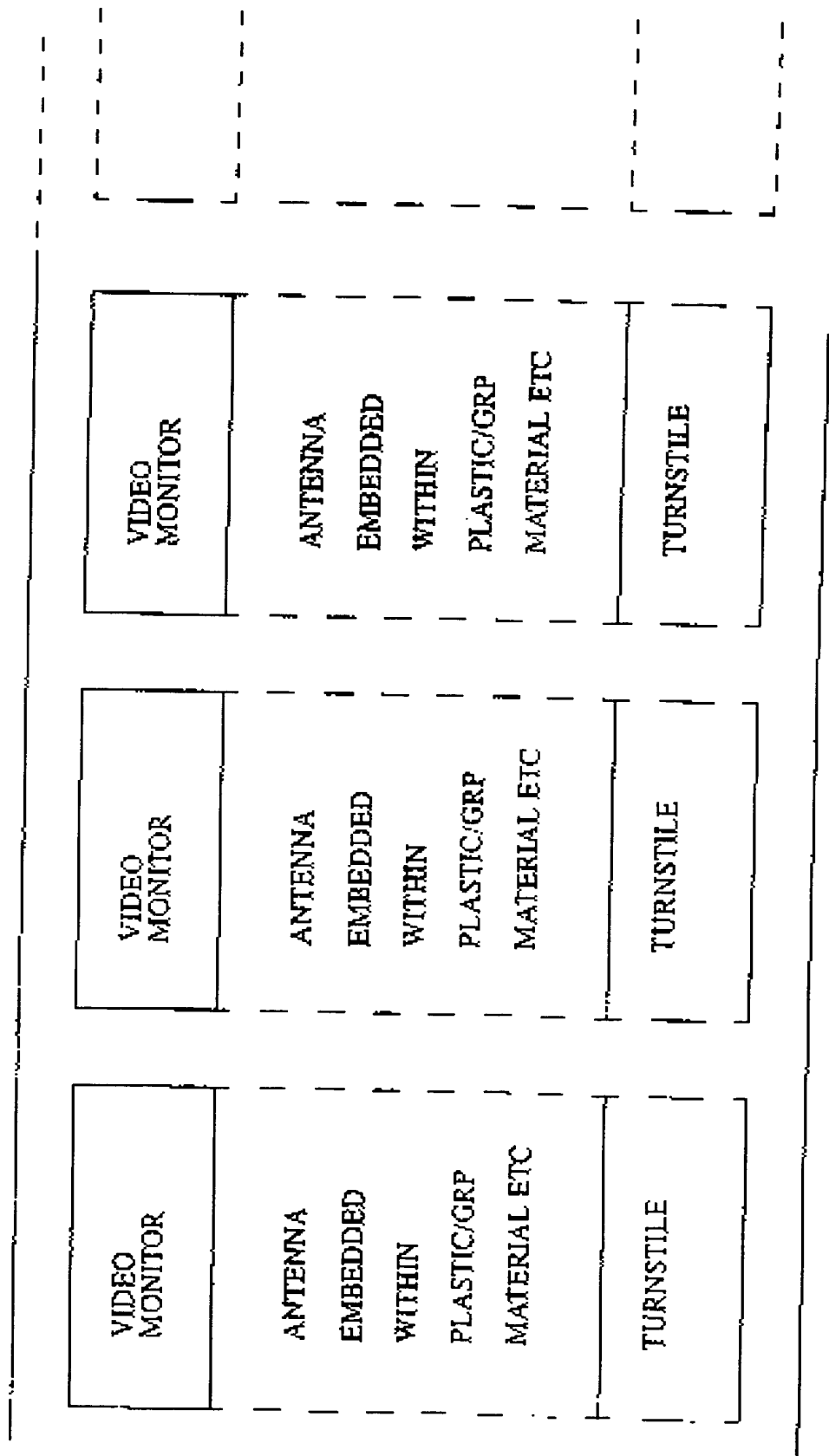
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Figure 1 : BLOCK DIAGRAM OF RADIO BASED ACCESS CONTROL SYSTEM



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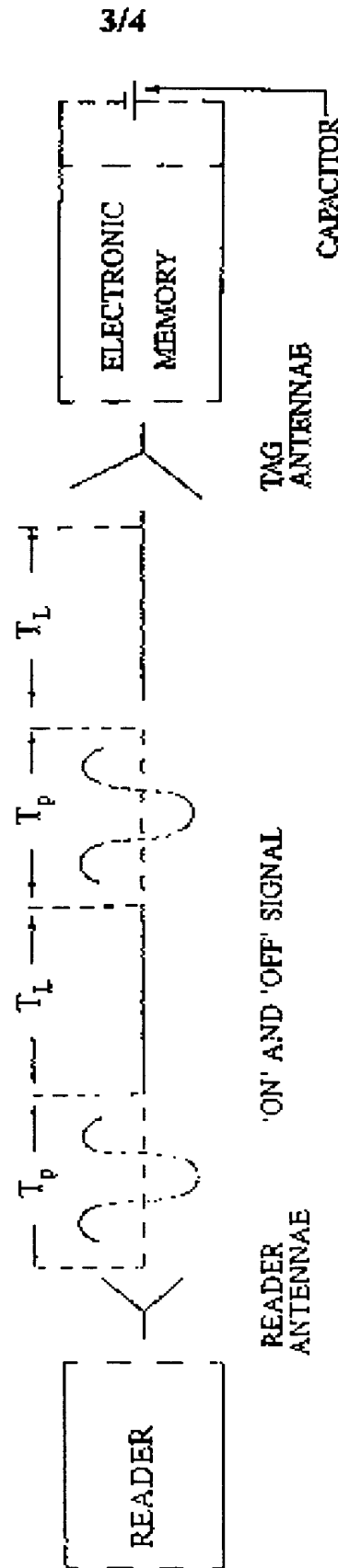
Figure 2 : MULTIPLE ACCESS GATE SYSTEM



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Figure 3 : TAG AND READER OPERATION (passive tag)



$T_p$  is the time required to charge up the capacitor and power up the electronic memory

$T_L$  is the time when the tag transmits its unique number to the reader

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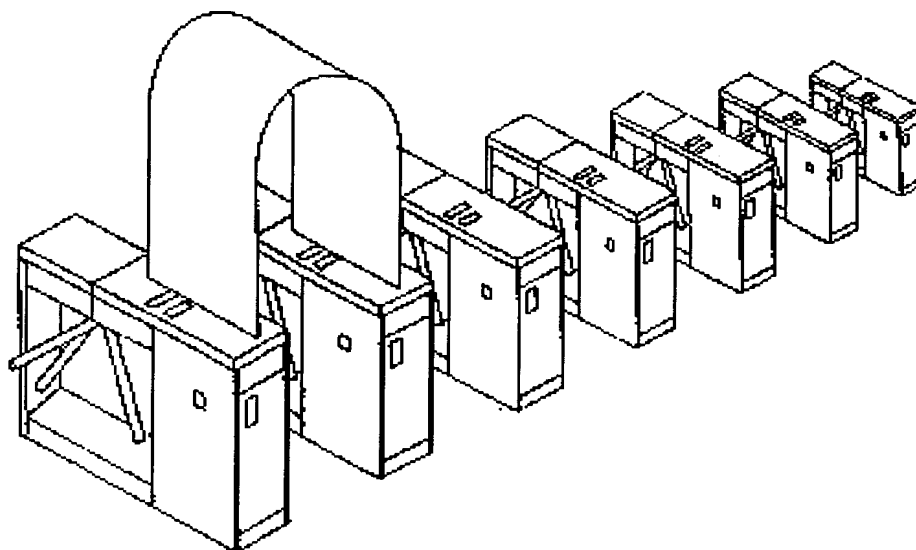


Figure 4 : Isometric diagram showing possible multiple access gate system (antenna hood shown diagrammatically covering one entrance only).

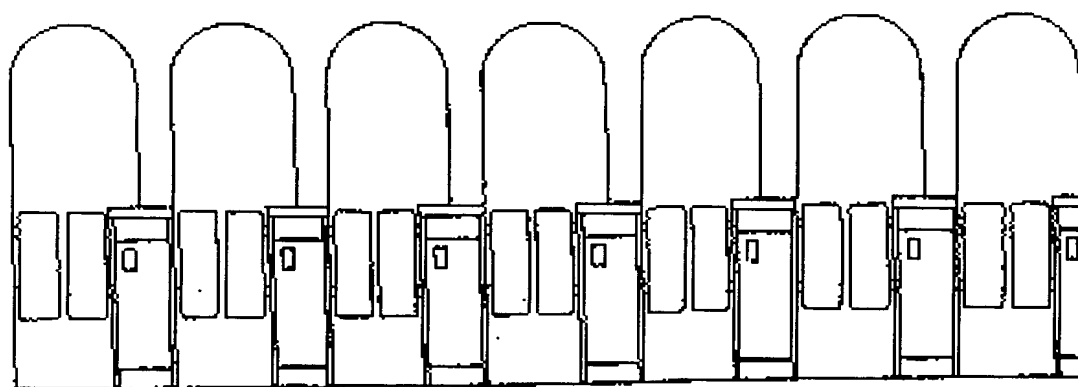


Figure 5 : Elevation of multiple access system. The number of gates accords to the capacity of the section of the complex being controlled.